

the waste gases are taken off by a port through the roof, the hot gases cannot distribute themselves uniformly; the hottest currents tend to rise and pass out of the waste gas port in the roof, and there will be currents of cold and therefore heavy gases in the neighborhood of the ingots on the hearth, which accordingly will not be well heated.

Therefore the waste gases should always be carried away from the heating chamber by a port at the level of the hearth of the furnace; the colder currents of gases will then pass out of the heating chamber and their place will be taken by currents of hot gases; under these conditions the ingots will be well heated. These remarks apply to furnaces of all kinds, and are a general rule for the construction of all furnaces of rational design. It has been well established that the port for the waste gases must be located at or below the level of the hearth of the furnace.

Returning to the computations, the equation (B) may be considerably simplified, if it is assumed that the weight of a cubic meter of waste gases is the same as the specific weight of air (1 kg 29). This is very nearly true. Therefore,

$$v_r = \frac{1.29 - 1}{1 + at} \sqrt{2gH} \quad (6)$$

$$Q = K \cdot I \cdot \sqrt{2gH} \quad (7)$$

The expression H_{at} is that of the velocity head ft, because

$$\text{Therefore } h = H_{at},$$

$$\text{and } \frac{h}{t} \approx \frac{1}{273},$$

Therefore the ratio of the head required to generate the velocity to the height H is equal to the ratio of the temperature t to 273.

This expression will be found used later in connection with

jets of gas, page 65.